STAT 411-616 – ADVANCED STATISTICAL METHODS
SYLLABUS – Spring 2020

Instructor
Dr. Marina Vannucci
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Office hours by appointment only

Meeting Time: TR 1.00pm – 2:15pm, DH1064

Attendance: Students should register for the course through Rice University. Those who wish to audit the course should obtain written permission from the Instructors.

Course Description
Advanced topics in statistical. As an instructor dependent course in advanced statistical methods, STAT 411/616 will focus this spring term on modern computational methods. For example, obtaining distributions (mcmc, bootstrap), estimation (EM), variable selection (mcmc), classification (CART, BART). A Bayesian view of some of these topics will be used. No Bayesian background is assumed.

The goal of the course is to provide a quick introduction to several computational methods. Coding will be required but the course will not provide an introduction to programming. Written assignments will require strong coding abilities.

STAT 616 will have more advanced assignments and examinations focusing on theoretical methods. STAT 411 will have assignments and examinations focusing more on basic concepts than on theoretical methods

Pre-requisites:
(STAT 310 OR STAT 312 OR ECON 307 OR ECON 382 OR STAT 315) AND
(STAT 410 OR STAT 615)

Course Assignments
Homeworks will be due at the start of the class period on the deadline date. No late homework will be accepted. Illness and family emergencies will be dealt with on an individual basis. Graded homeworks will be returned timely. Students must complete all homeworks to pass the class.

There will be 5-to-6 HWs and a final project, with a written report and a short presentation.

Grading Policy: Homework: 40%**;** Final Project: 60%

Textbook
Lecture slides will be made available. The reference textbook is Givens and Hoeting Computational Statistics, Second Edition, 2nd ed. Wiley, 2011

Auxiliary Source
Gentle, Hardle, Mori (eds) Handbook of Computational Statistics, Springer

Course objectives and learning outcomes:
Upon successfully completing this course, students will be able to:

1. Describe common deterministic stat algorithms, such as Newton-Raphson and EM
2. Describe common stochastic algorithms used in statistics, such as Monte Carlo methods, Markov Chain Monte Carlo, stochastic optimization, Gibbs sampling, Metropolis-Hastings method
3. Understand mathematical properties of common statistical algorithms
4. Implement stat algorithms with a high-level statistical programming language

Honor Code Policy
Students are encouraged to talk to each other, the teaching assistants or the instructor about any homework assignment. This assistance is limited to the discussion of the problem. On written assignments, you will be asked to write and sign the honor code pledge. With your signature, you pledge that the work is your own and that you have not received help from anyone, neither with any other student in the class, nor with any other person, other than the instructor.

Additional policies:

- Students are not allowed to look at homework problems or solutions or quizzes/exams from previous years.
- When turning in written assignments, students are responsible of making sure all codes and outputs are attached to their work. No additional material will be accepted after the due date.
- For written assignments, you are allowed to consult the textbook, your notes and the material on the website, including homeworks, but you are not allowed to consult general on-line resources, including Wikipedia.
- For written assignments please use R codes distributed in class, when available, written/modified by yourself, and attach the code to your work. Use of software platforms ("blackbox"), such as "jags", "bugs" and "stan", is permitted only when specified by the instructions.
- Questions about grades on written assignments should be brought to the attention of the Instructor within 5 days from the date you receive the graded papers.

Any student with a documented disability needing academic adjustments or accommodation is requested to speak with me during the first two weeks of class. All discussions will remain confidential. Students with disabilities should also contact Disability Support Services in the Ley Student Center.

Syllabus Change Policy
This syllabus is only a guide for the course and is subject to change with advanced notice.